LG 3.6/7.2kV~12kV Switchgear

- GQM-V07 and V12
- GSM-V07
- CERTIFICATE

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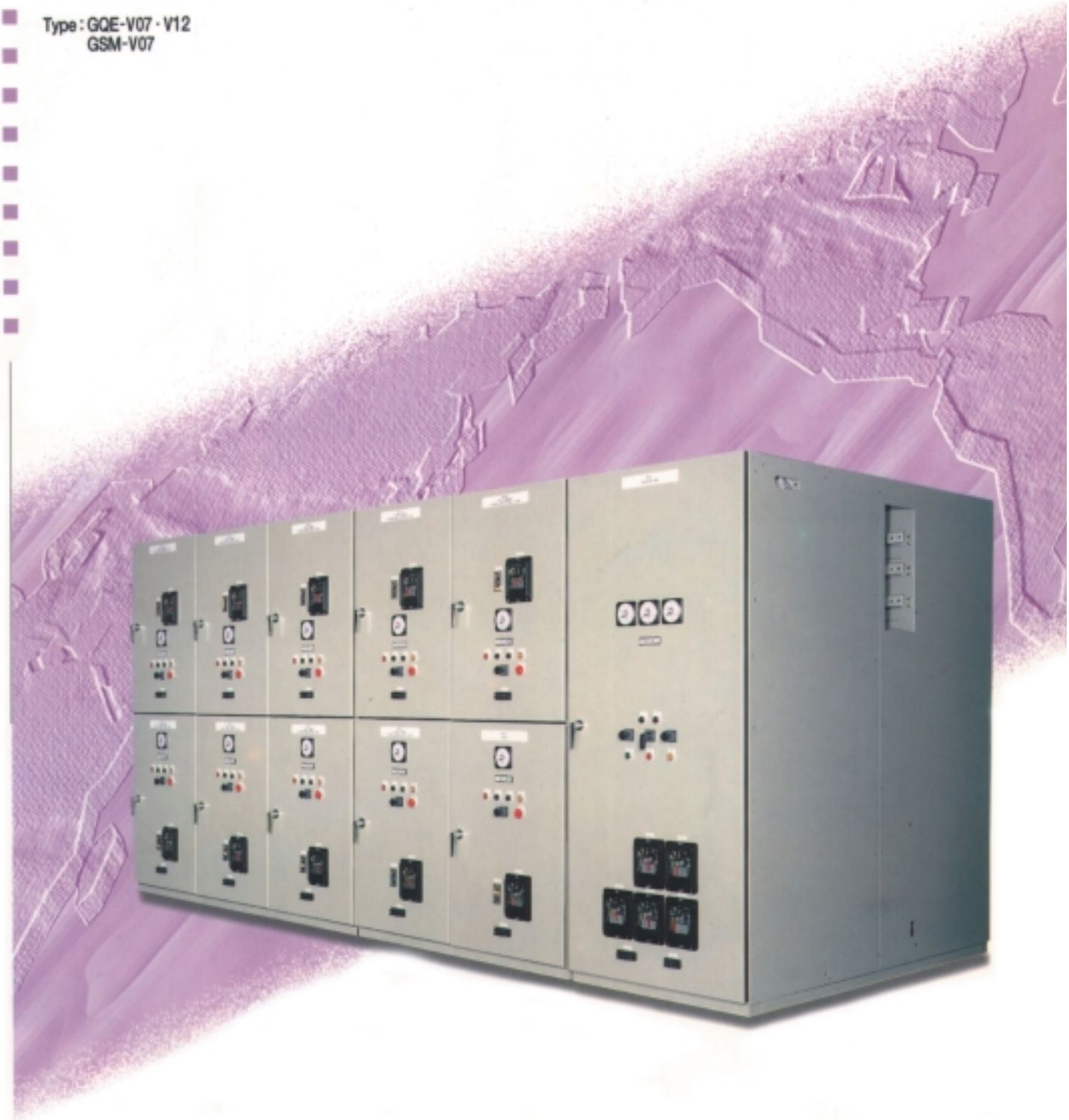
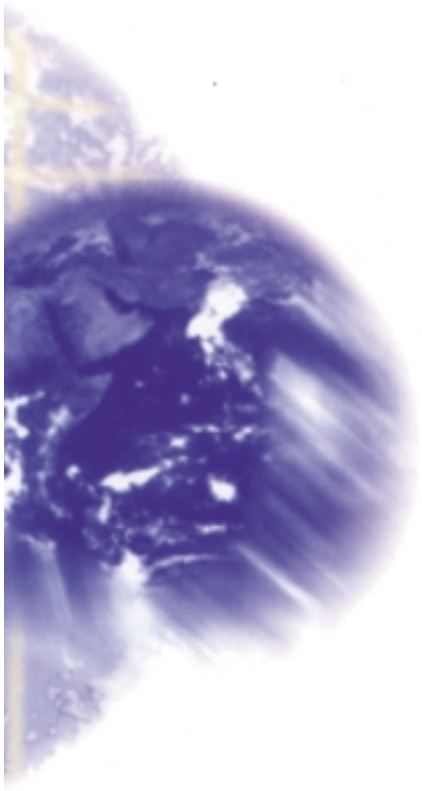
LG Industrial Systems

LG 3.6/7.2kV~12kV Switchgear

Type : GQE-V07 · V12
GSM-V07





3.6/7.2kV~12kV Switchgear

LG GQM and GSM metal-clad high-voltage switchgears have been designed and manufactured with functionality and safety in mind by using vacuum circuit breakers that excel in breaking performance.
The switchgears contribute to energy conservation in power receiving/distribution facilities of power generating stations and their substations, industrial plants, buildings, water supply facilities, and waste water disposal plants.

COMPACT DESIGN

- Possibility of various equipment arrangements according to user requirements, compact design with emphasis on function and safety, and product standardization have made a shorter lead time possible while ever-simpler installation process allows for reduced construction time.
- Various monitoring and measuring devices are ergonomically designed for maximum convenience of use.

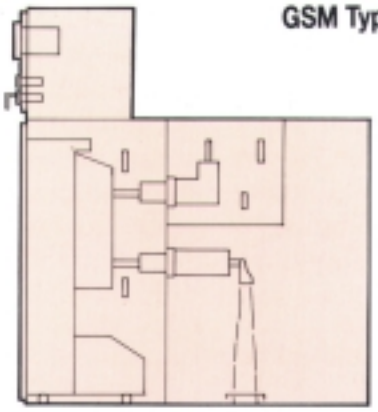
SAFETY ASSURANCE

- Uses a vacuum circuit breaker that is smaller and lighter yet excels in performance and easy for service and check.
- Conforms to the standards of ANSI, JEM and IEC for safety.
- Compartment of units with grounded metal isolation walls provides enhanced safety during operation, service and/or inspection.
- Each compartment or cubicle is isolated by metal barrier to prevent spreading of damage from an accident.
- Mechanical interlocks are used to prevent misoperation.

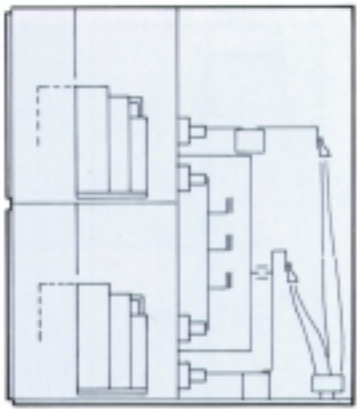
SIMPLIFIED MAINTENANCE AND INSPECTION

- Auxiliary equipment, such as the circuit breaker, potential transformer or lightning arrester, is also of draw-out type for easy pullout from cubicle, making maintenance and inspection much simpler.
- The installed vacuum circuit breaker seldom needs maintenance and inspection, and a direct visual observation of the breaker contact can be made to check for its wear condition from the operation position at the front.

GM Type



GSM Type



Standard Ratings

Type		Truck type		General type
		GQM-V07	GQM-V12	GSM-V07
Circuit breaker		VCB		
Rated voltage(KV)		3.6/7.2	12	3.6/7.2
Rated insulation level	Power frequency/1 min(kV)	10/20	28	10/20
	Impulse/1.2x50μs(kV)	45/60	75	45/60
Rated frequency(Hz)		50/60		
Rated bus current (A)		630,1250,1600,3000		
Rated short-time withstand current (kA/1 sec or 3 sec)		8,12.5,16,20,25,31.5,40		
Rated peak withstand current(kA)		2 times the rated short-time current		
Applied standard		IEC 298, ANSI C37. 20, JEM 1425		

Note: Above standard ratings are based on IEC. For ANSI or JEM, respective ratings shall be applied to relative standards.

GQM-VO7 and V12

- LG GQM and GSM metal-clad high voltage switchgears are truck-type,vertical and stand-alone equipment, designed and manufactured with functionality and safety in mind by using vacuum circuit breakers that excel in breaking performance.
- LG GQM switchgear is designed, constructed and tested in accordance with IEC standards. To minimize installation space with minimized physica l dimensions, insulation materials of excellent performance andthrough-type bus supporting materials are used.
- There are two types of GQM switchgears: door type and panel type. Door-type GQM switchgear bears a title of GQM-V07D or V12D while panel type bears a title of GQM-V07P or V12P

Standard Ratings

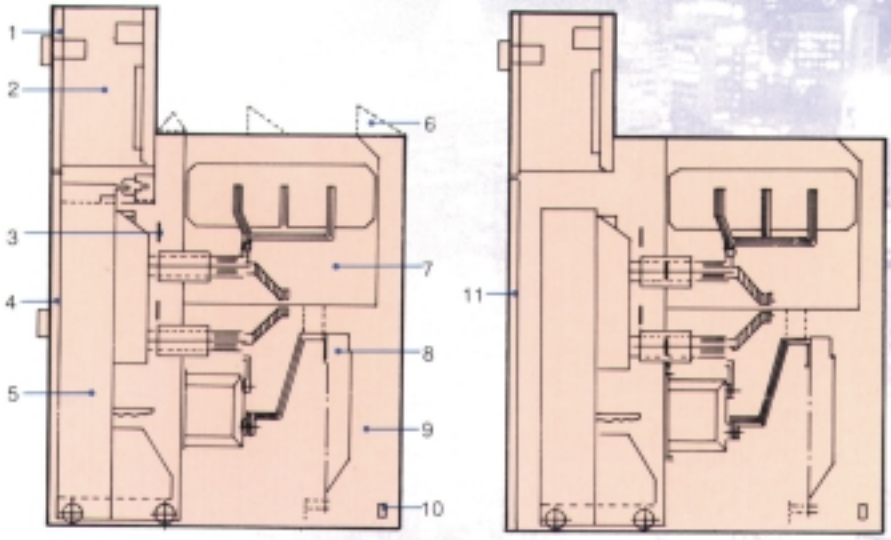
Type		Rating				
		GQM-VO7			GOM-V12	
Rated voltage (kV)		3.6/7.2			3.6/7.2	
Rated insulation level	Power frequency/1 min (kV)	10/20			10/20	
	Impulse/1.2 x 50 μS (kV)	45/60			45/60	
Rated frequency (Hz)		50/60				
Rated bus current (A)		630A-1250A-1600A-3000A				
Rated short-time current(kA)		25, 1sec/ 3sec				
Circuit breaker	Rated current (A)	630A-1250A-1600A-3000A				
	Rated breaking current (kA)	12.5	16	20	25	31.5
	Making current (kA)	31.5	40	50	63	80
Rated peak withstand current(kA)		2.5 times the rated short-time current				
Standard specifications		IEC 298				
Protective structure	Enclosure	IP 3X(Note 1)				
	Internal isolating walls	IP 3X(Note 2)				
Applied standard		Bare or insulated coating (Note 3)				

Note:

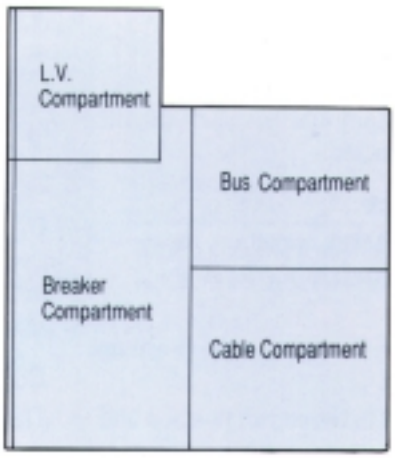
1) IP 4X or up to IP 54 as per IEC 529 can be manufactured upon request.
2) Protective isolating walls can be used for up to IP 3X upon request.
3) Busbar can be insulated upon request. (Insulation can withstand maximum circuit voltage for 1 minute.)

1.Construction

1. Door front instruments
2. Low voltage compartment
3. Safety shutter
4. VCB front panel
5. Breaker compartment
6. Pressure release panel (optional)
7. Bus compartment
8. Cable connection terminal
9. Cable connection compartment
10. Grounding bus
11. Front door



- GQM-V07 and GQM-V12 consist of four functionally independent compartments each.
- Units are interchangeable when ratings are identical.
- Cubicle is designed in compliance with IEC standards.
- Expansion of internal arc fault can be prevented.
- Breaker compartment is equipped with an automatic shutter that works in conjunction with installation/removal of the breaker.
- Room is provided for additional equipment installation.

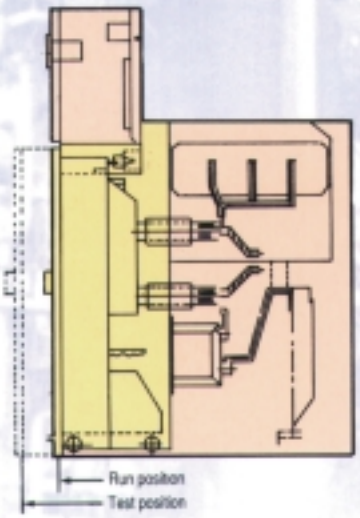


Casing

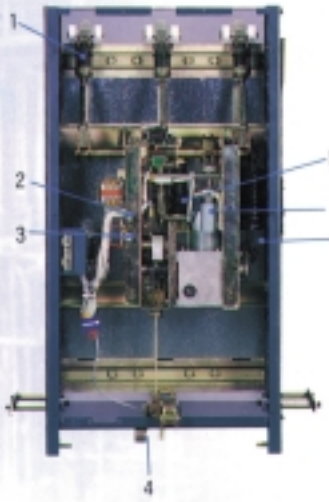
Item		Thickness of steel plate (mm)
Frame		2.3
Front	Door	2.3
	Panel	2.3
Rear cover		1.6
Ceiling plate		1.6
Bottom plate		2.3
Partitioning wall		1.6
Side cover		1.6

Note: Thickness of steel plates for doors and covers can be changed upon request.

Breaker compartment



Structure of breaker



1. Contact pressing spring
2. Manual trip push button
3. Manual closing button
4. Interlock
5. Trip spring
6. OOP
7. Closing spring

The circuit breaker installed in GQM switchgear moves to independent positions below inside the breaker compartment.

- Run (connected) position
  and auxiliary circuits are connected.
- Test position
  Main circuit is disconnected while auxiliary circuit is connected.
- Disconnected position
  Connector for auxiliary circuit is manually removed at test position, and both main and auxiliary circuits are disconnected.

Safety interlock

To prevent mistaken operation, the following mechanical interlocks are provided:

- Once closed, the circuit breaker can not be removed
- During shift between run position and test position, the circuit breaker can not be removed.

Grounding

The circuit breaker is automatically connected to grounding bus through a ground shoe, which maintains its grounded condition while the circuit breaker moves between run and test positions.

Safety shutter

Installed between the circuit breaker compartment and an adjoining compartment that is electrically linked to the circuit breaker compartment is an automatic shutter, which operates in conjunction with the circuit breaker. If the circuit breaker is removed, live parts will be automatically shielded.

Operation mechanism

- Electrically and mechanically trip free.
- Equipped with anti-pumping device.

Stable breaking performance

With an excellent insulation property, the switchgear is able to interrupt small or massive current within a short arc time, exhibiting a stable breaking performance.

Complete mechanical indicators

The circuit breaker is equipped with the following mechanical indicators:

- Open/Close indicator
- Charge/Discharge of spring
- Operation counter
- Open/Close push button
- Contact wear condition indicator

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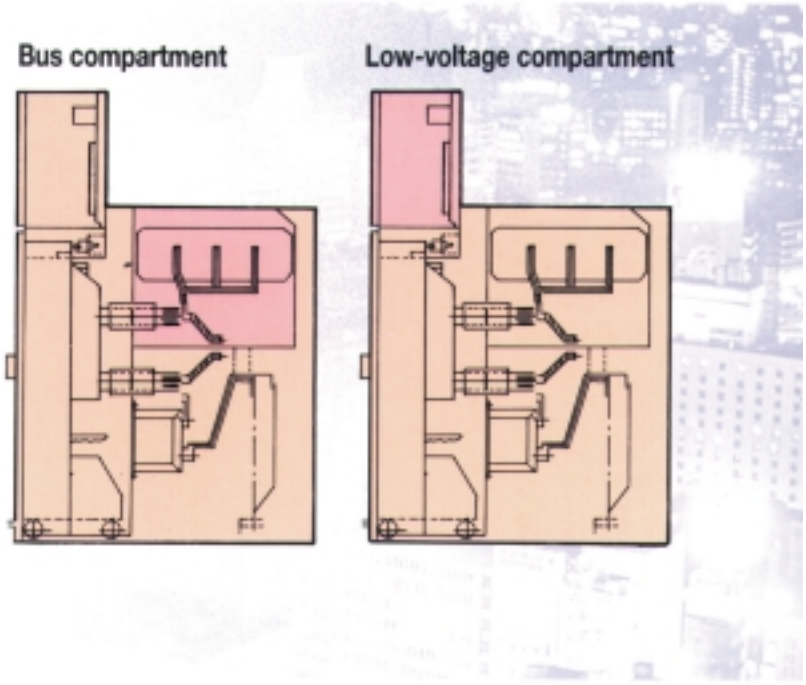


- The busbar is of high-strength and high conductivity copper.
- Insulated bus can be provided upon request. The joints have insulated covers to enable on site process.
- The insulated bus can withstand a rated voltage of the circuit for 1 minute.
- Busbar is designed to sufficiently withstand short-time rated current. The conductor is a straight angle and contact points are Ag-plated.
- Maintenance and inspection of bus compartment are carried out in the following steps:
  – Detach the removable cover and internal cover at the rear.
  – Pull out the circuit breaker and remove the internal cover which is mounted with bushing. Then, you are ready to perform service.

The low-voltage compartment is located in the upper front part (on top) of the circuit breaker compartment. It has a hinged door on which protective relay, meter, switch and indicator lamp are mounted. Terminal blocks related to various control and operational relays are installed inside.

- The instruments mounted on the door are so arranged as to ensure convenient operation and monitoring.
- The compartment is isolated from adjoining one (High-voltage charger) with grounded metal partition to ensure safety in service performance.

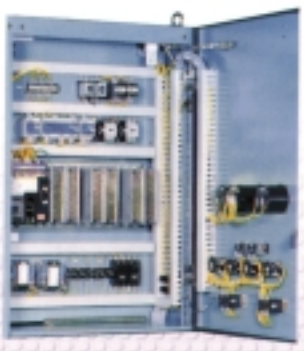
Wiring

The wire used is 600 V, KIV, 1.25 mm^2 and 2 mm^2 in grey color in accordance with Korean Industrial Standards (green for grounding wire). Other sizes and colors are available upon request. Wiring method is as follows:

Wiring specifications

Item	Standard specification	
Cable Way	Resin cable duct	
Wire	600 KIV wire	
Wire Size(Note 1)	General control circuit	2 mm^2
	CT,PT 2nd or 3rd	2 mm^2
Wire Color(Note 1)	General	Grey
	Grounding	Green
Termination	type	Ring tongue type
	Insulated cap with instrument number	(Note 2) Wire
	Ring with polarity indication	

Note : 1. Sizes and colors may be changed upon request.
2. Wire number may be added upon request (Optional).



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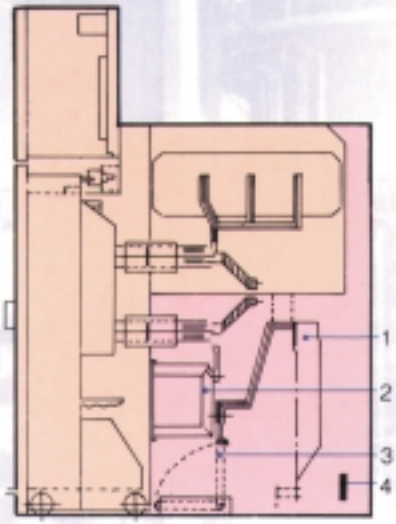
Cable compartment



1. Cable terminals
2. CT
3. Earthing switch
4. Ground bus

Current transformer

The current transformer is of molded epoxy resin type, and comes in a wide variety upon request.

Cable termination

Sufficient space is provided for cable termination and entry in the lower part at the rear. The space can be easily accessed by opening the rear cover.

Earthing switch (optional)

Line earthing switch is available upon request. The switch is designed for control at the front of the switchgear, and a mechanical interlock is provided on the circuit breaker and earthing switch for prevention of accidents arising from mal- operation.

■ Others

Indications of phase and polarity of main bus

Item	Standard specification					
Phase/polarity	AC				DC	
	R(A) phase	S(B) phase	T(C) phase	N phase	P (positive)	N (negative)
	Red	White	Blue	Black	Red	Blue

Incoming/outgoing of cable and wire

Name	Standard specification	
Power cable	Incoming at the lower rear part	
Control cable	Incoming & outgoing at the right lower part of the front	
Terminal connection	Compression or crimp-type terminals	
Incoming cable termination	Operation terminal block, brackets and supports	
Parts not supplied for termination	Operation	Solderless terminals & related tags
	Main circuit cable	Cable heads, crimp-type terminals

Name plate on switchgear

Item	Standard specification			
	Material	Color	Letter color	Letter type
Phase/polarity	Acrylic	White	Black	Gothic
Switch plates	Metal	Silver	Black	Gothic

Other parts

Name	Standard specification
Space heater	Supplied for indoor & outdoor type(AC 220V, 80W)
Fluorescent lamp	Optional
Receptacle	Optional
Special tools	One set per group is supplied
Cubicle connecting bolt	Needed quantity is supplied.

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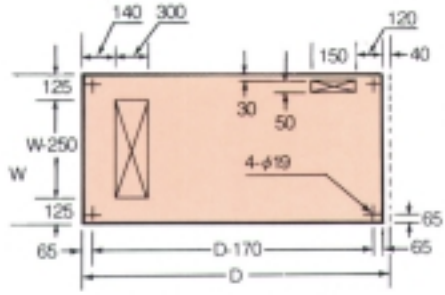
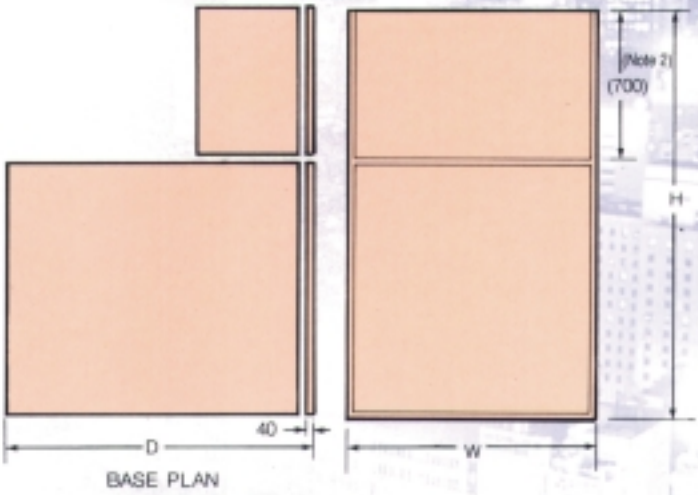
2. Dimensions





Type	Rated voltage (kV)	Rated short-time current (kA)	Rated current, circuit breaker (A)	Dimension				
				Width (W)	Depth			(Note 3) Height (H)
					Feeder	Bus-Tie	Incomer	
GCM-V07P (GCM-V07D)	3.6/7.2	12.5	630	(Note 1) 650	1250 (1500)	1250 (1500)	1250 (1500)	2100
		16	1250					
		20	2000					
		25	(Note 2) 3000	900	2600	2600	2600	2300
GCM-V12P (GCM-V12D)	12	12.5	630	650	1350 (1600)	1350 (1600)	1350 (1600)	2100
		16	1250	700				
		20	2000					
		25						

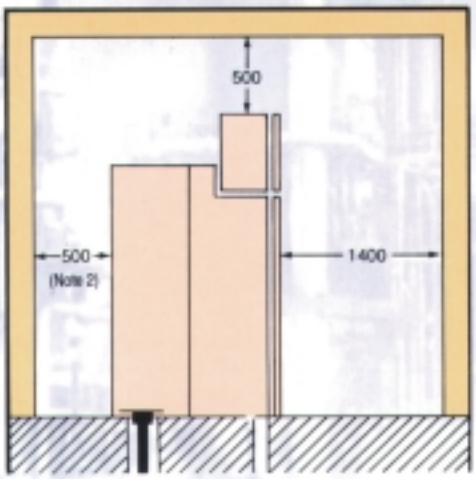
Note: 1. Figures in parenthesis apply to door type only.

Note: 2. Applies to metal clad switchgear for KEPCO's hydraulic and thermal power plant use only.

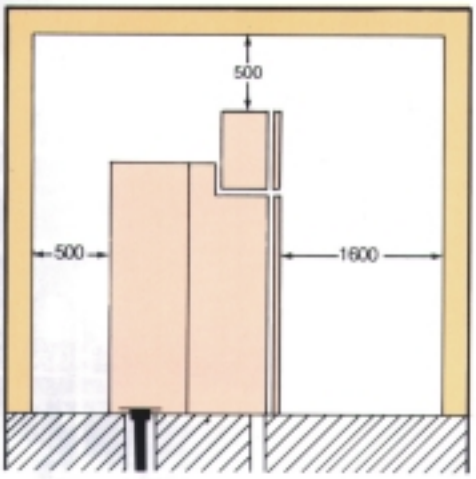
Note: 3. Height varies according to type of equipment installed in L.V. compartment (2100~2300 mm)

3. Minimum installation space

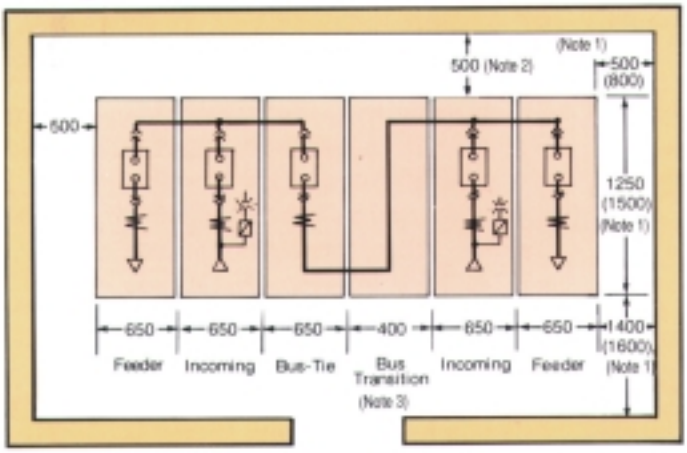
GQM-V07P



GQM-V07P



Arrangement

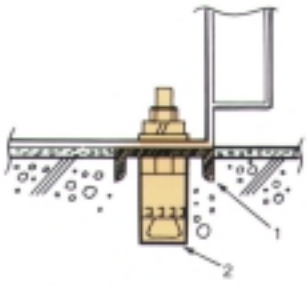


Note: 1. Figures in parenthesis apply to GQM-V07D only.

Note: 2. Space for installation/removal of rear cover
(required space for installation of rear door: 1300).

Note: 3. Bus-transition panel for both 07V and 12V is W=400.

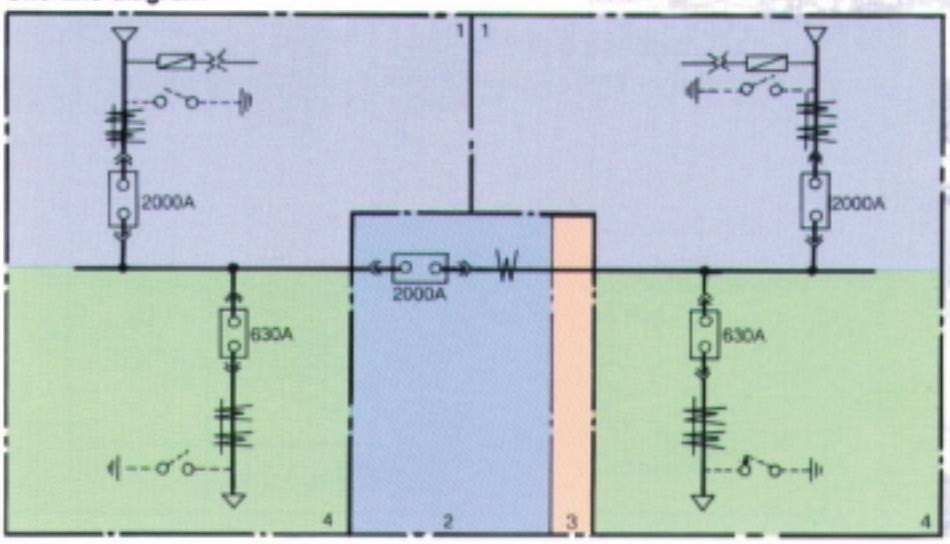
Foundation



1. Foundation channel
(to be arranged by user)
2. Anchor bolts (1/2" x 100 mm)

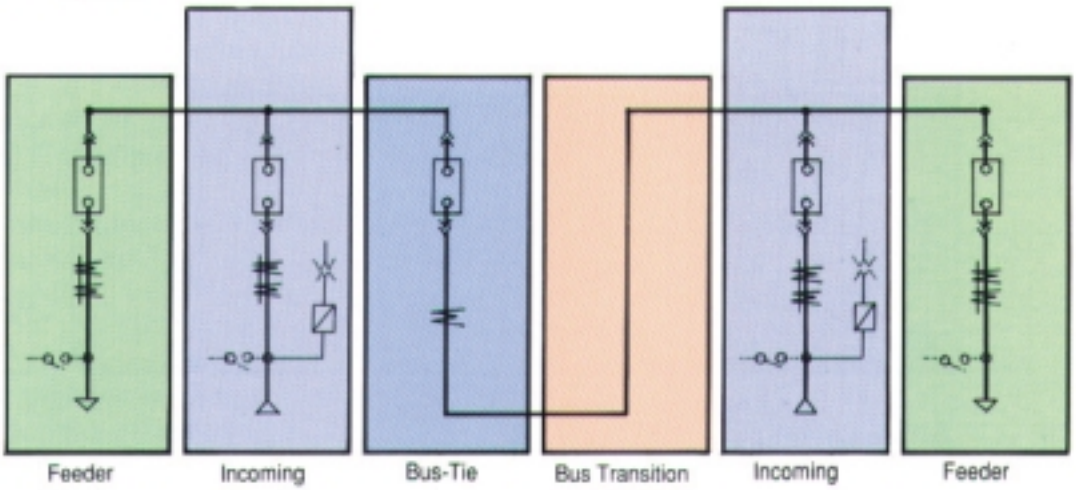
4. Example of System Configuration

One-line diagram

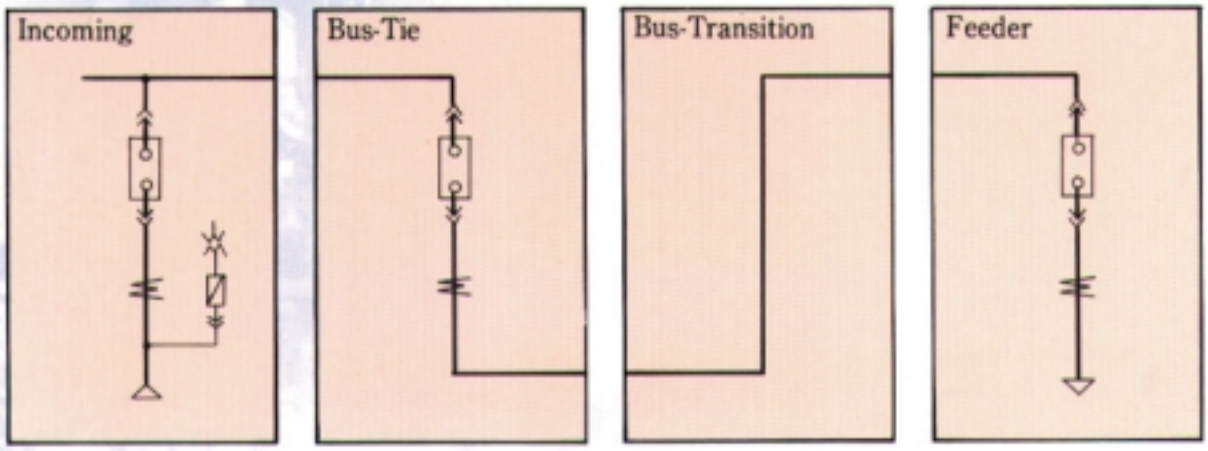


1. Incoming
2. Bus-Tie
3. Bus Transition
4. Feeder

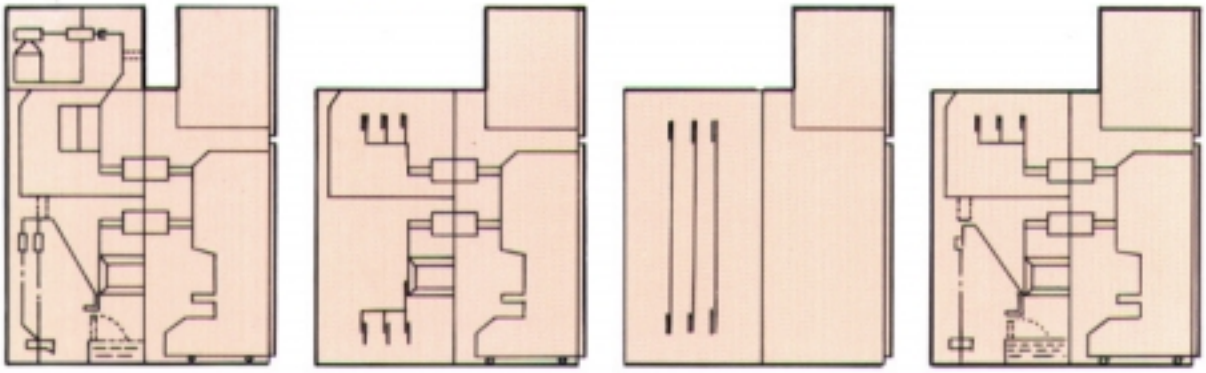
Arrangement



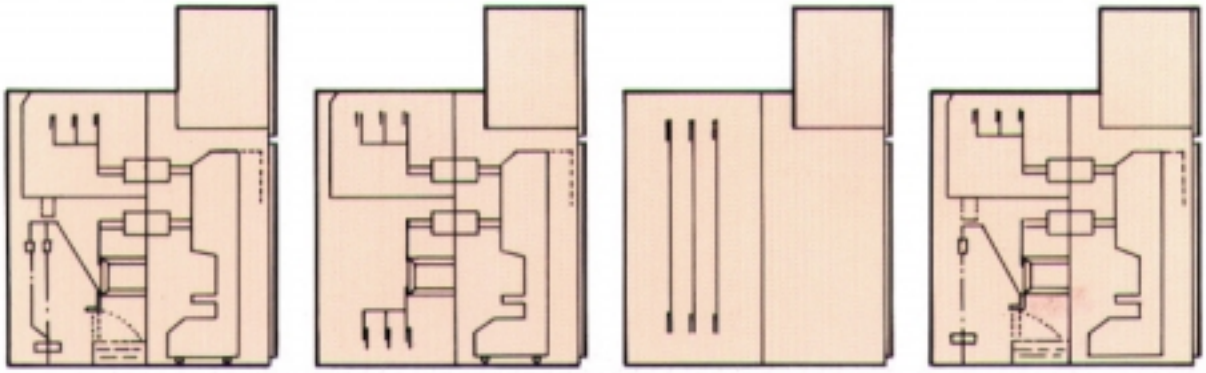
Lay-out of switchboard



Sectional views of GQM-V07P & V12P



Sectional views of GQM-V07D & V12D



GSM-V07

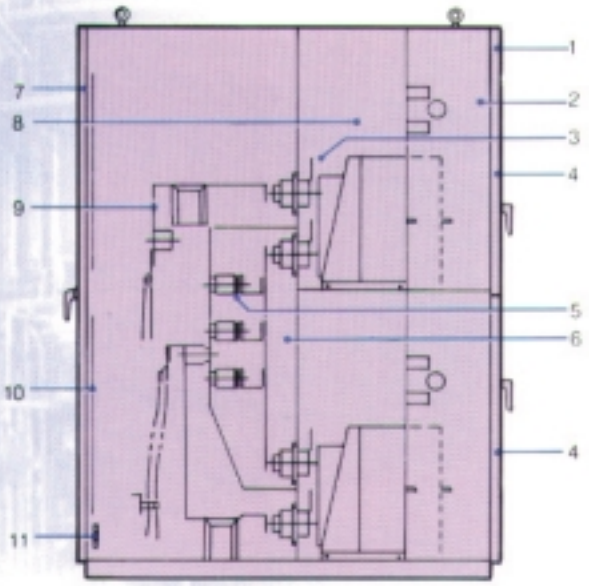
- LG GSM-V07 switchgear is designed, manufactured and tested in compliance with IEC standards and can be applied to a wide range of water and electric distribution facilities.
- LG GSM-V07 switchgear can accommodate any types of circuit breakers including VCB and GCB. VCBs are used in standard LG switchgears.
- LG GSM-V07 switchgear can be applied to any types of bus systems including single bus systems and double bus systems. (Please consult LG for types and sizes of switchgears for systems other than bus-type systems).
- LG GSM-V07 switchgear may be applied to any standards including JEM, IEC and ANSI. The standard used in LG switchgears is IEC 298.

Standard ratings

Type		GSM-V07
Circuit breaker		VCB
Rated voltage		3.6/7.2kV
Rated insulation level	Power frequency/1min(kV)	16/22
	Impulses/1.2×50μs(kV)	45/60
Rated frequency (Hz)		50/60
Rated bus current (A)		630, 1250, 2000, 3150, 3,150
Rated short-time current (kV/sec)		8, 12.5, 16, 20, 25, 31.5, 40
Rated peak withstand current		2.5 time of rated short-time current
Circuit breaker (kA)	Rated current (A)	400-630-1250-2000-3150
	Rated breaking current (kA)	8, 12.5, 20, 25, 31.5, 40
	Rated making current (kA)	20, 31.5, (40), 50, 63, 80, 100
Standard specification		JEM 1425, IEC 298
Type of switchgear		CW, MW(G), PW(G)

Note: 1. VCB has been adopted in IEC development test and acquired KS certificate.

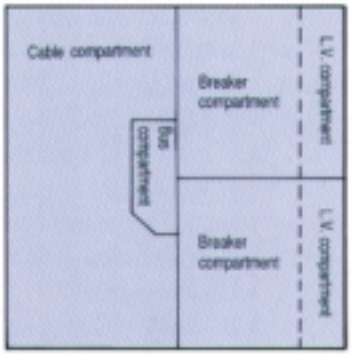
1. Construction



1. Door front instruments
2. L.V. compartment
3. Shutter
4. Front door
5. Main bus
6. Bus compartment
7. Rear door
8. Circuit breaker compartment
9. Feeder
10. Protective cover
11. Grounding bus

- GSM-V07 consists of a number of independent compartments as shown in the figure.
- Internal instruments are interchangeable if the ratings are identical.
- Cubicles are designed by class as per JEM or IEC standards.
- Casing and partitioning walls of individual compartments are made of grounded metal to ensure safety during maintenance and inspection.
- Room is provided for additional equipment installation.

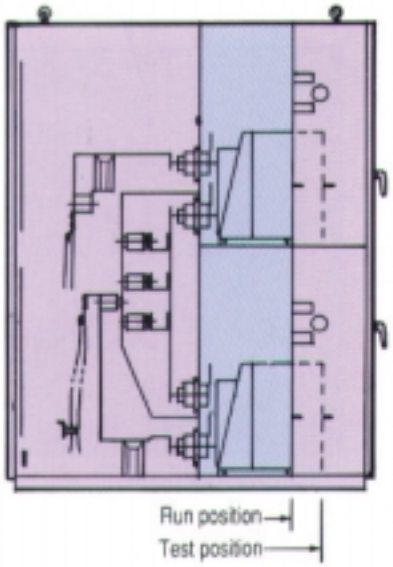
Classification of compartment



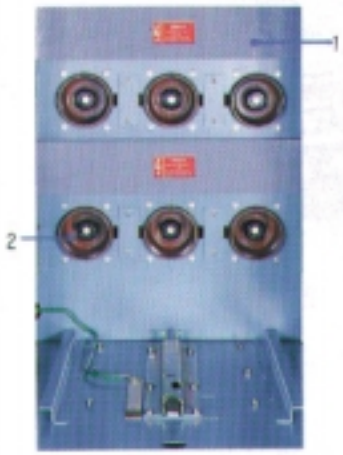
Steel plate specification

Item	Thickness of steel plate(mm)
Front door	3.2
Rear door	2.3
Top plate	1.6
Bottom plate	2.3
Partitioning wall	1.6
Side cover	1.6

Breaker compartment



Internal view of breaker compartment



1. Safety shutter
2. Circuit spouts

Structure of breaker

1. Connector
2. Closing button
3. Tripping button
4. Interlock lever
5. Drawout lever

The circuit breaker installed in GSM-V07 moves to independent positions inside the breaker compartment as shown below.

- Run (connected) position
  Both main and auxiliary circuits are connected.
- Test position
  Main circuit is disconnected while auxiliary circuit is connected.
- Disconnected position
  Connector for auxiliary circuit is manually removed at test position, and both main and auxiliary circuits are disconnected.

Safety interlock

To prevent mistaken operation, the following mechanical interlocks are provided:

- Once closed, the circuit breaker can not be moved.
- During shift between run position and test position, the circuit breaker can not be closed.

Grounding

The circuit breaker is automatically connected to grounding bus through a ground shoe, which maintains its grounded condition while the circuit breaker moves between run and test positions.

Safety shutter

Installed between the circuit breaker compartment and an adjoining compartment that is electrically linked to the circuit breaker compartment is an automatic shutter, which operates in conjunction with the circuit breaker. If the circuit breaker is removed, live parts will be automatically shielded.

Features

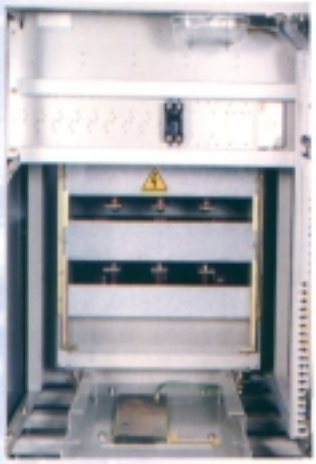
- This circuit breaker is small and light-weighted, yet excels in breaking performance. It can be mounted in a unit standardized in double stacks with 7.2 kV, 40 kA and up to 2000 A .
- The VCBs for 7.2 kV and 20 kA or less use electronic closing devices, and designed and manufactured to maintain operation at a steady rate.
- Wear condition of valves can be monitored from the front of the unit.

Operation mechanism

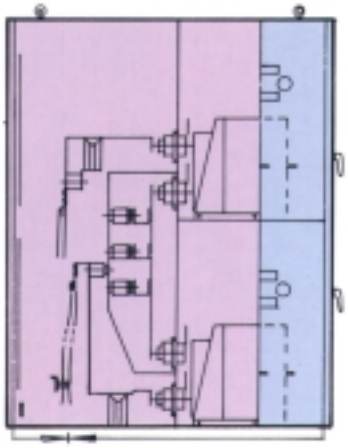
- Electrically and mechanically trip free.
- Equipped with anti-pumping device.

Stable breaking performance

With an excellent insulation property, the circuit breaker is able to interrupt small or massive current within a short arc time, exhibiting a stable breaking performance.



Low-voltage compartment



Operation mechanism

- Electrically and mechanically trip free.
- Equipped with anti-pumping device.

Excellent breaking performance

A 3-cycle circuit breaker, working irrespective of voltage or breaking capacity, with outstanding structural designing, the circuit breaker exhibits short breaking time and is able to successfully interrupt heavy duties such as abnormal ground, high speed reclosing and opening/closing of condenser circuit.

Maintenance and inspection

The structure of the circuit breaker is simpler; hence there are fewer items to service and check. The only major concern will be to check wear condition of contacts.

Control, measuring and monitoring instruments are laid on the front door of the L.V. compartment and the front side of the circuit breaker compartment for easy and safe checking, repairing and measuring activities.

- Operating instruments deployed inside are safely isolated from live parts for safe checking process during operation.

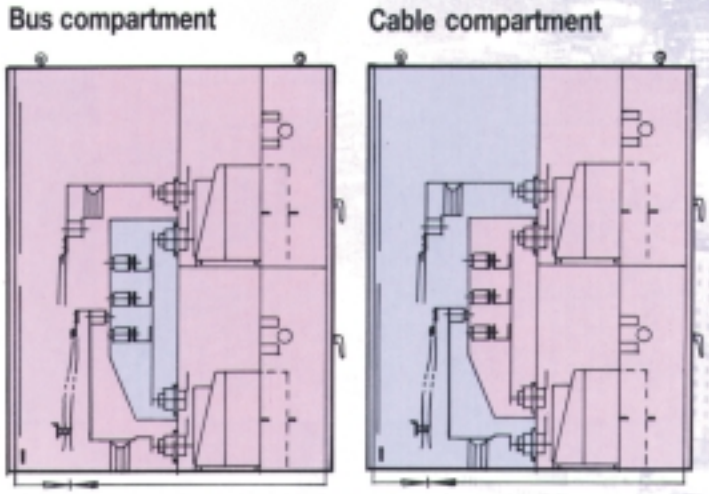
Wiring

The wire is of Korean Industrial Standard, 600V KIV 1.25 mm^2 and 2 mm^2 in gray color (green for ground wire). Wiring method is as follows:

Wiring specification

Item		Standard specification
Cable way		Resin cable buct
Wire		600 KIV wire
Wire size (Note 1)	General control circuit	$2mm^2$
	CT/PT 2nd or 3rd	$2mm^2$
Wire color (Note 1)	General	Grey
	Grounding	Green
Termination	Type	Ring tongue type
	Insulated cap with instrument number	(Note 2) Wire
	Ring with polarity indication	

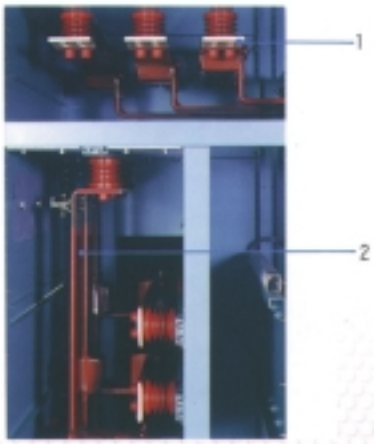
Note: 1. Sizes and colors may be changed upon request.
Note: 2. Wire number can be added upon request (Optional)



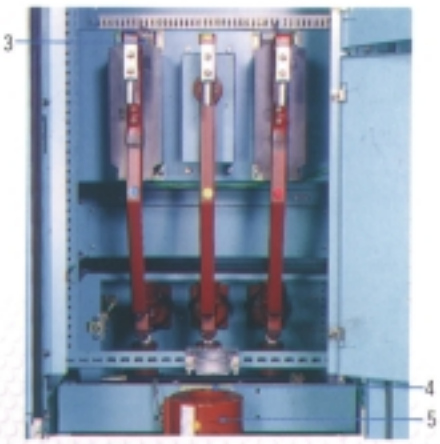
- The busbar is of high-strength and high-conductivity copper.
- The busbar is supported by prop insulator made of epoxy resin or through-type bushing fixed on a side plate.
- The busbar is designed to sufficiently withstand short-time rated current. The conductor is produced in a straight angle shape.
- Contact points are Ag-plated for improved contact performance.

Sufficient space is provided for convenience in cable connection along the top and bottom at the rear of the cubicle. The compartment comprises:

- Fixed-type current transformer
- Cable connection terminals (optional)
- Brackets (optional) and supports



1. Branch bus
2. Horizontal bus

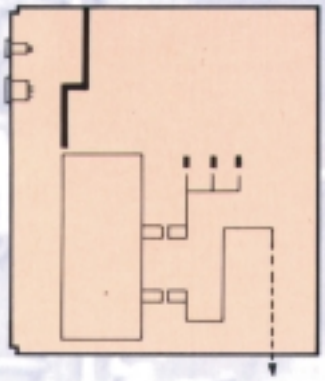


3. Feeder bus
4. Bracket
5. Current transformer

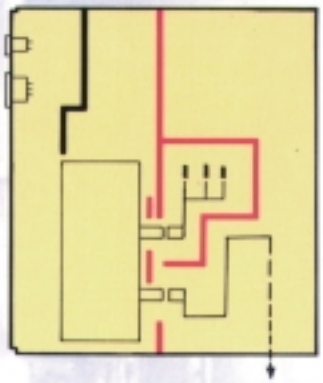
Contents Index

Others

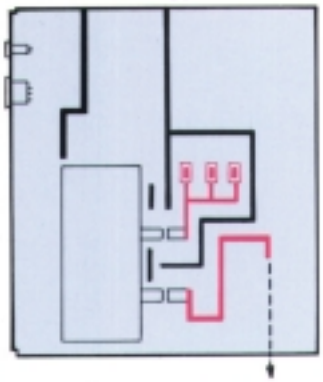
CW type



MW/PW type



PWG/MWG type



Name plate on switchgear

Item	Standard specification			
	Material	Color	Letter color	Letter type
Phase/polarity	Acrylic	White	Black	Gothic
Switch plates	Metal	Silver	Black	Gothic

Other parts

Name	Standard specification
Space heater	Supplied for indoor & outdoor type (AC 220V, 80W)
Fluorescent lamp inside panel	Optional
Receptacle	Optional
Special tools	One set per group is supplied
Cubicle connecting bolt	Needed quantity is supplied.
Door stopper	Optional

Indications of phase and polarity of main bus

Item	Standard specification					
Phase/ polarity	AC				DC	
	R(A) phase	S(B) phase	T(C) phase	N phase	P(positive)	N(negative)
	Red	White	Blue	Black	Red	Blue

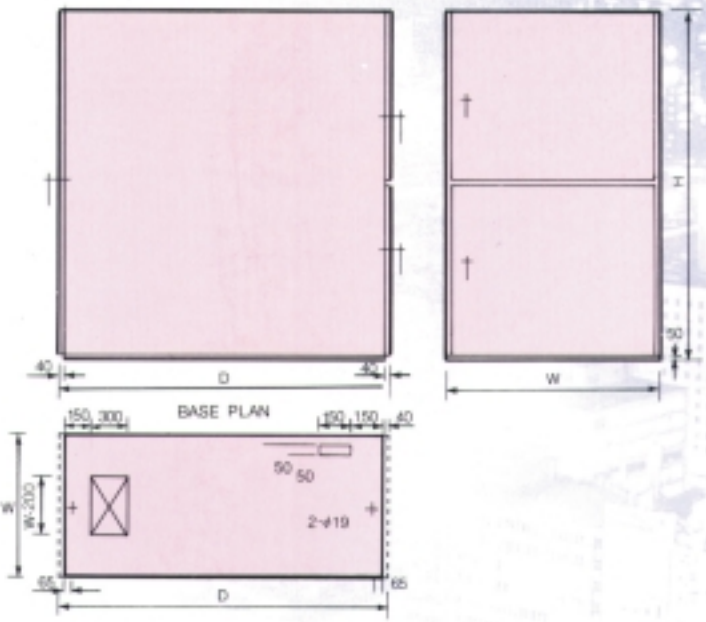
Comparison of metal clad switchgears based on JEM 1425 (refer to the figure on the right.)

Type	CW type	MW and PW types	MWG and PWG types
Circuit breaker	• Main circuit is automatically connected. • Control circuit is manually connected.		
Partitioning wall	• Partition between monitor/control section and main circuit section	• Partitions between monitor/control unit and main circuit, and main busbar and other units. • Shutter is installed in circuit breaker compartment.	• Partitions between monitor/control unit and main circuit, and main busbar and other units. • Shutter is installed in circuit breaker compartment.
Insulation bare	• Main circuit busbar: bare	• Main circuit busbar: bare	• Main circuit busbar: insulated

Incoming/outgoing of cable and wire

Name	Standard specification	
Power cable	Incoming at the lower rear part	
Control cable	Incoming & outgoing at the right lower part of the front	
Terminal connection	Compression or crimp-type terminals	
Supplies for termination	Operation terminal block, brackets and supports	
Parts not supplied for termination	Operation	Solderless terminals & related tags
	Main circuit cable	Cable heads, crimp-type terminals & bolt

2. Dimensions



Dimensional code system for switchgear

The dimensions of metal clad switchgears use a code system as shown in the example below:

Example)

Number of circuit breaker stacks

Depth of switchgear

Width of switchgear

(unit: m/m)

Width (W)	Depth (D)	Number of stacks
700	1800	1
700	2000	2
900	2200	3
1000	2300	
1200	2400	

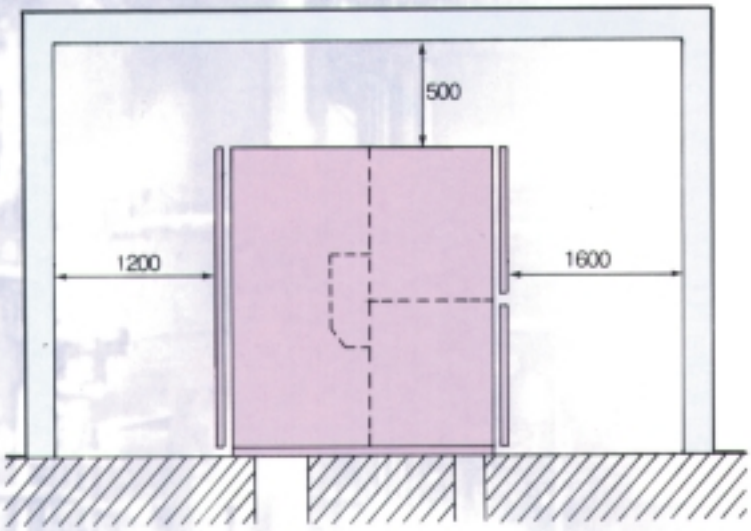
The height of switchgear is 2300 mm (exclusive of 50 mm for base)

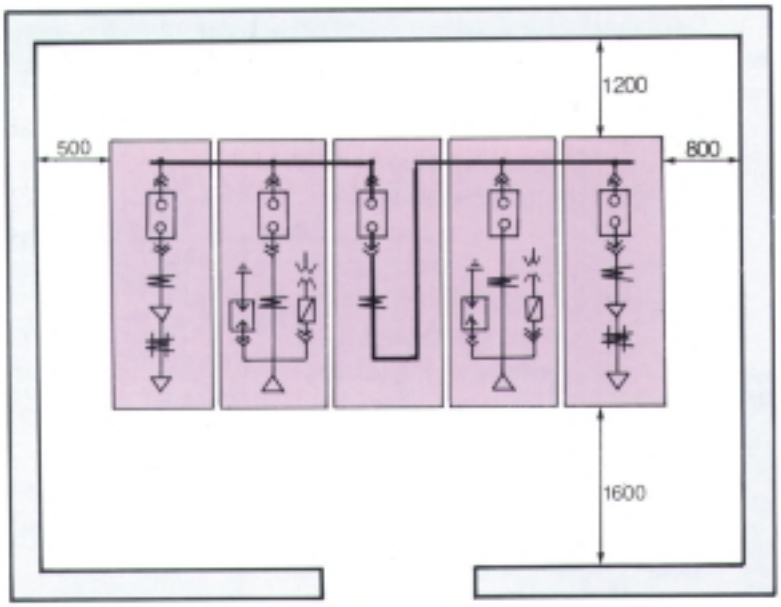
Type	Rated voltage(kV)	Rated short-time current (kA/sec)	Rated current of circuit breaker	Dimensional code
GSM-V07G	3.6 / 7.2	8	400	802
		12.5	630	
		20	630	822
			1250	
		25	630	
			1250	
		31.5	1250	922
			2000	942(932)
			3150	942
		40	1250	922
			2000	942(932)
			3150	942

Note : 1. Figures in parenthesis represent minimum size.

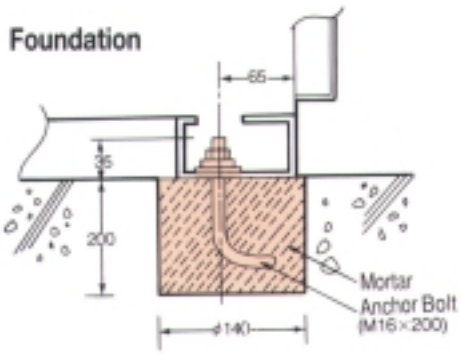
Note : 2. For the panel width of bus tie panel, add 100 mm to the panel width.

3. Minimum installation space



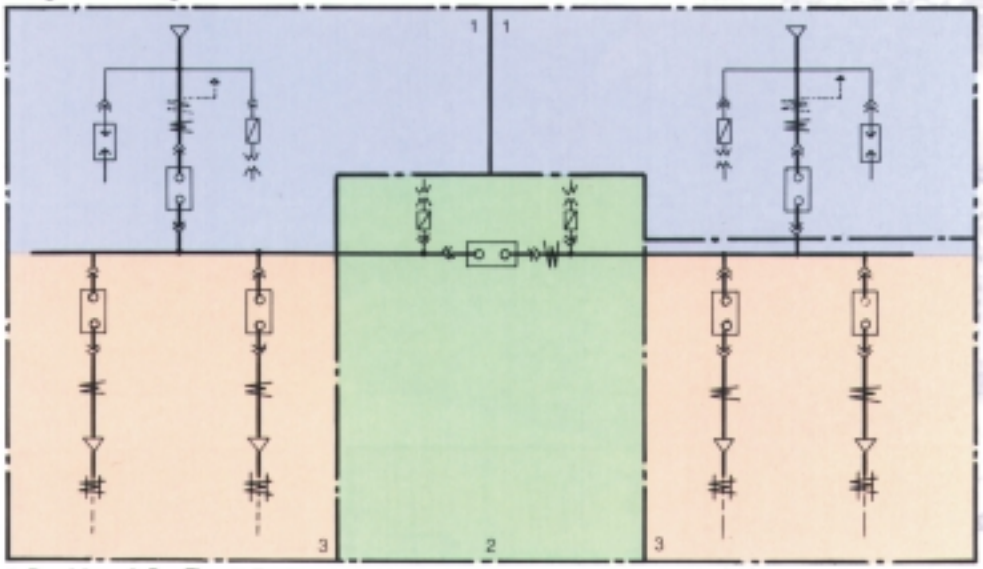


Foundation

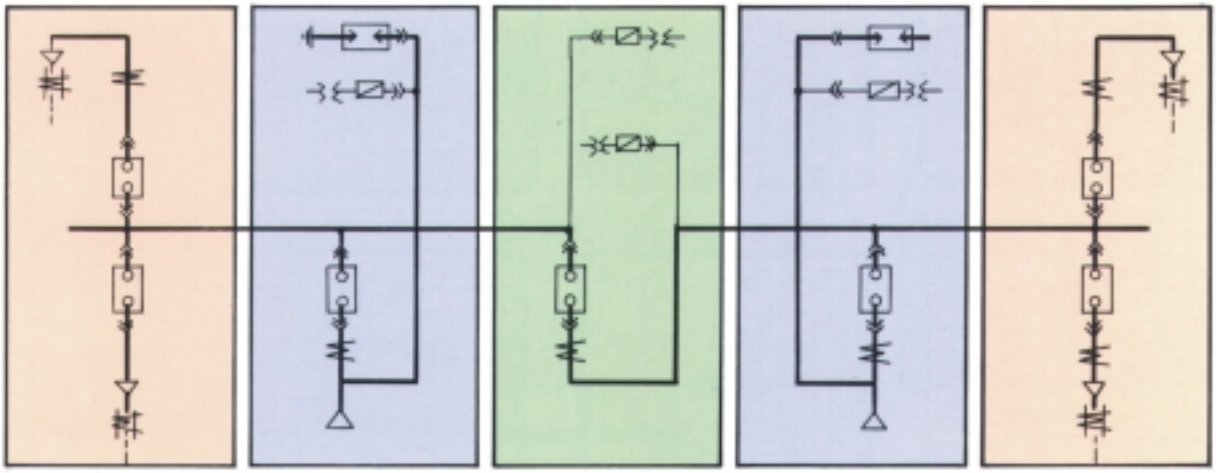


4. Example of System Configuration

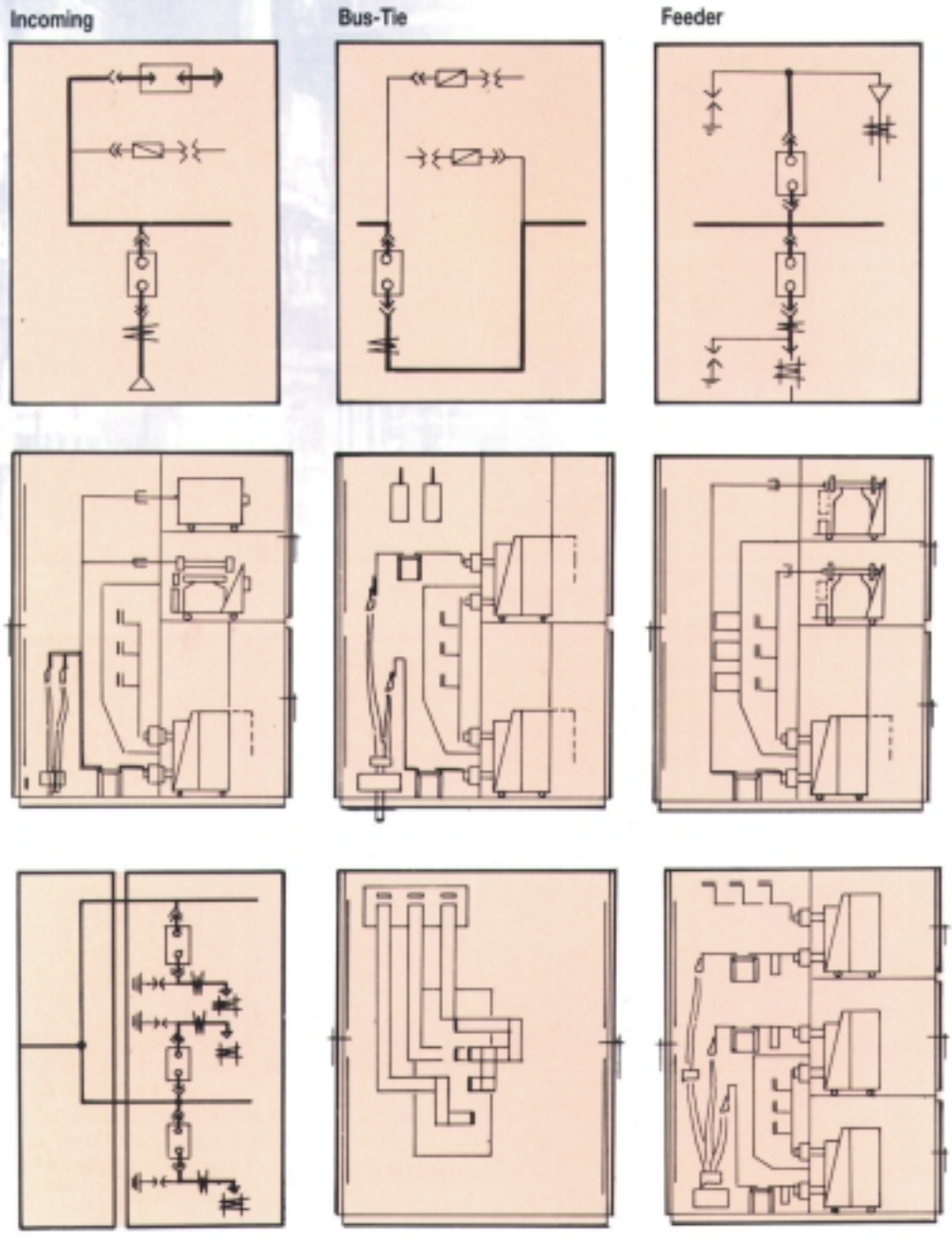
Single line diagram



1. Receiving 2. Bus-Tie 3. Feeder



Sectional views of switchgear



TÜV CERT

CERTIFICATE

The TÜV CERT Certification Body of TÜV Rheinland Sicherheit und Umweltschutz GmbH

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LG Industrial Systems Co., Ltd.

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has established and applies a quality system for

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An audit was performed.

Report No. **3284**

Proof has been furnished that the requirements according to

DIN EN ISO 9001

are fulfilled.

The certificate is valid until **October 1999**

Certificate Registration No. **00 100 3284**

Cologne, 20.02.1997

TÜV Rheinland

TÜV CERT Certification Body of TÜV Rheinland Sicherheit und Umweltschutz GmbH

Memo

LG constantly endeavors to improve our products, so that information in this catalog is subject to change without notice.

LG Industrial Systems Co., Ltd.

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